



UC Berkeley's



Computational Research and Theory (CRT) Facility

A NEW High Performance Supercomputer Center (HPC) for Scientific Computing in Berkeley, California

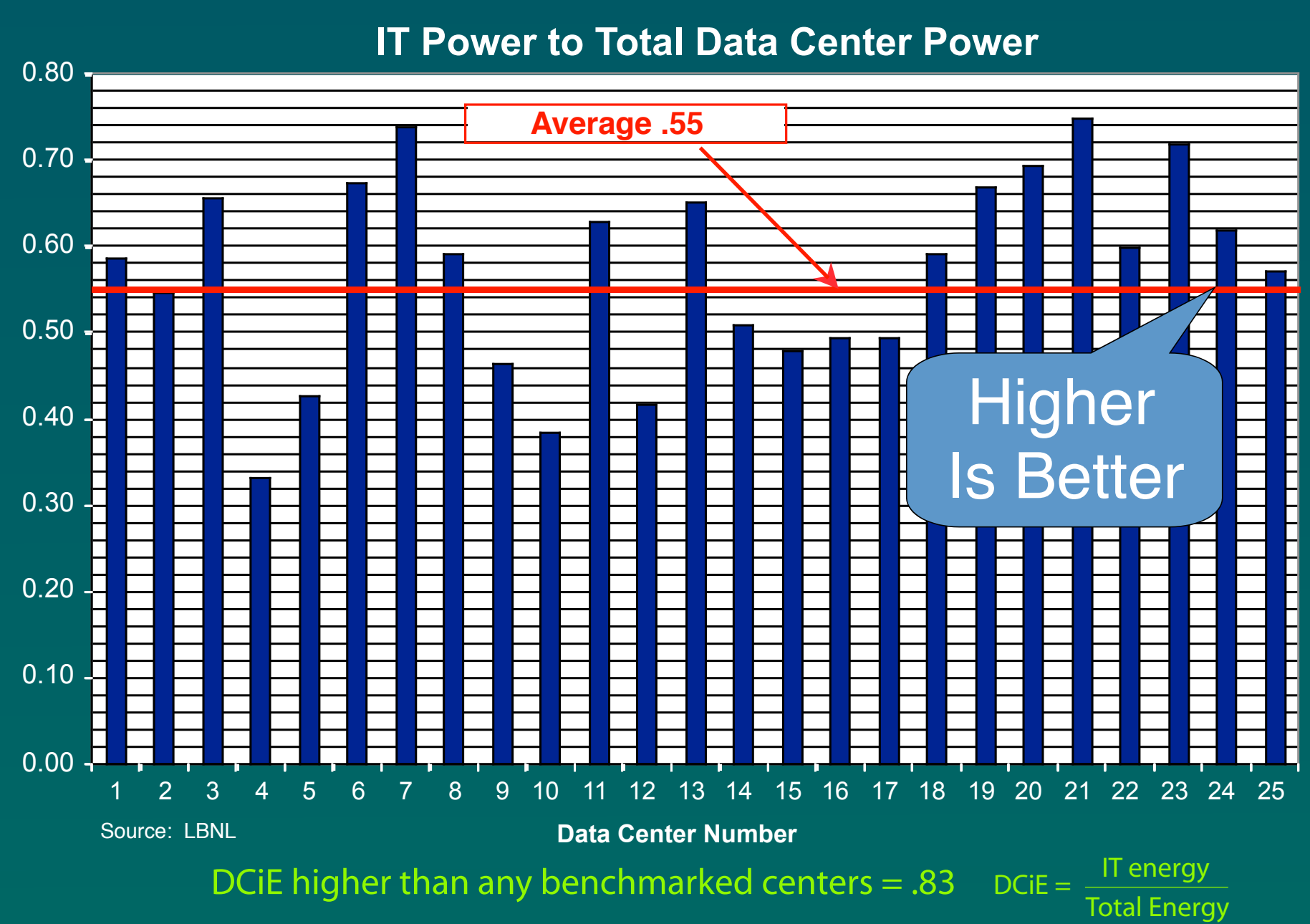
- 32,000 square feet computer room and 7.5 MW initial total power requirement, expanding to 17 MW
- Offices on second and third floors
- Mechanical space below HPC, chiller plant adjacent
- Total gross square feet 126,000
- Adjacent to other laboratory buildings



Lawrence Berkeley National Laboratory (LBNL)

CRT Project Goals and Objectives

- Energy efficient infrastructure
 - DCiE 0.83 or higher based on annual energy
 - Use of waste heat
 - Efficient system design
 - Take advantage of Berkeley climate
- Leading HPC capability
- Model of energy efficiency
- Maximum flexibility for future systems
 - Computer systems layout
 - Air and/or liquid cooling
 - Front to back or bottom to top airflow



Mechanical Design Challenges

- Many generations of high performance computers over several decades
- High computing load densities: 20–30 kW/rack
- Potential mix of air, liquid, or hybrid cooling
- Potentially different temperature and humidity requirements for different computer systems and other IT equipment
- Budget: must be life cycle cost effective

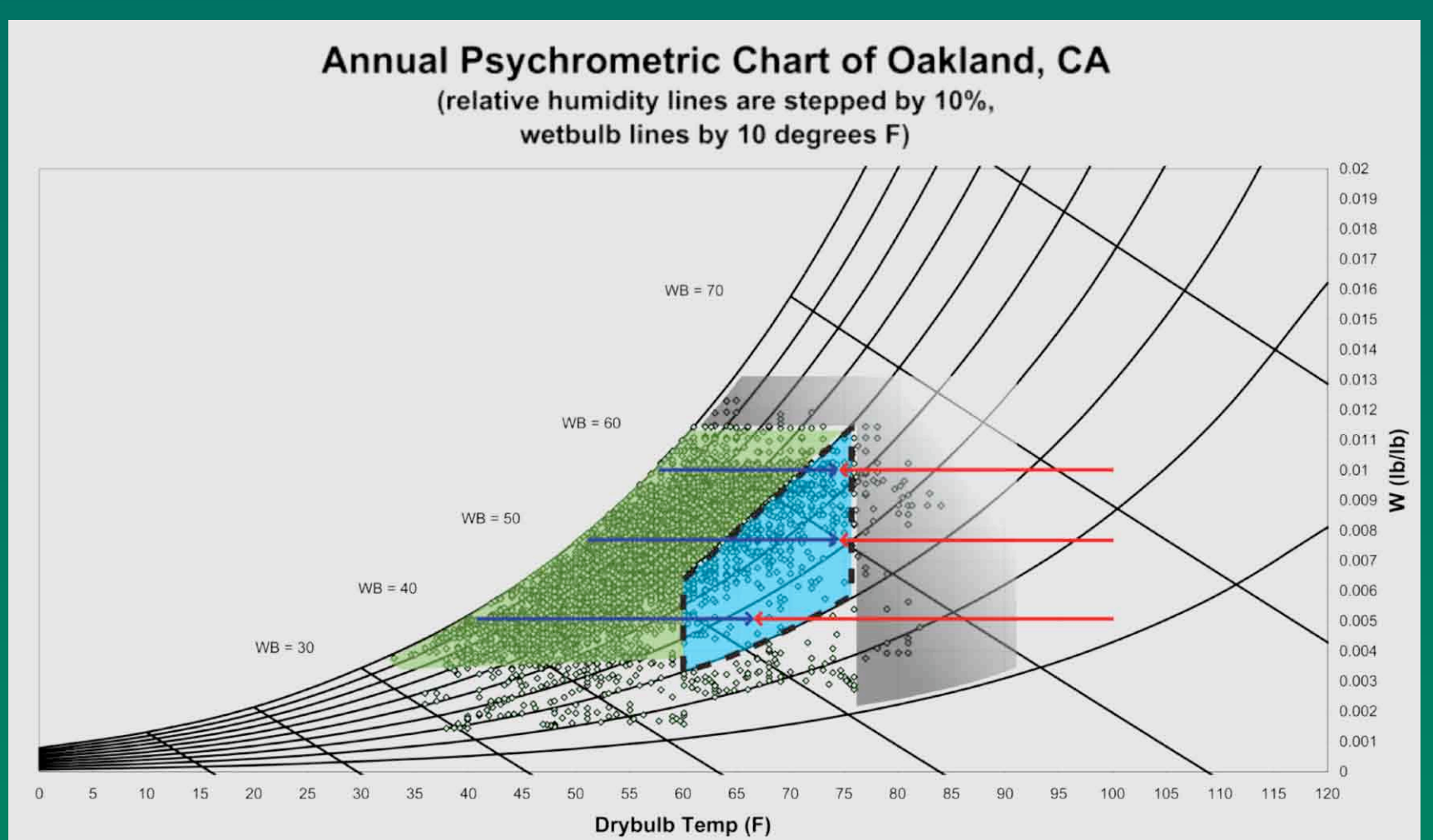


Design Advantages for Efficiency

- Minimal requirements for Uninterruptible Power Supplies (UPS) since work involves scientific computing
- Mild climate suitable for economizer cooling
- Ability to use full ASHRAE recommended temperature and expanded humidity ranges
- Integrated Architectural—MEP design

CRT Facility Energy Efficiency Measures

- Provision for Air economizer with evaporative cooling and integrated water economizers
- Higher temperatures in line with ASHRAE recommendations
- Provision for liquid cooling—4 pipe system to allow cooling with higher temperature with no chiller water
- Minimal use of UPS systems
- Large efficient fans



CRT design guidelines: 60 to 75F DB; 30-60% RH

- Low pressure drop system design
- Variable speed systems to follow load
- Efficient power distribution
- Air management
- Heat recovery—heating adjacent buildings

